

**Development of Hybrid Sensor Arrays for Sensor Arrays for
Simultaneous Measurement of Pressure and Shear Stress Distribution**

NASA Dryden Flight Research Center

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Progress Report
August 29, 2000



TAO OF SYSTEMS INTEGRATION, INC.

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Development of Hybrid Sensor Arrays for Sensor Arrays for Simultaneous Measurement of Pressure and Shear Stress Distribution

1. a. The key feature for the success of the proposed hybrid sensor array is the ability to deposit Cu-Ni alloy with proper composition (55 – 45) on a silicon wafer to form a strain gage. This alloy strain gage replaces the normally used Si strain gages in MEMS, which are highly nonlinear and temperature dependent.

The copper nickel, with proper composition (55 – 45), was successfully deposited on a silicon wafer with a few trials during this period of the project.

A photograph of the X-ray spectrometer indicating the composition is shown in Fig. 1.

- b. A photograph of the actual Cu-Ni alloy strain gage deposited on the Si diaphragm is shown in Fig. 2.
 - c. Selection of various materials for pads and a test of the deposited material are in progress.
 - d. Preliminary strain measurements have been made using commercial instrumentation with anticipated sensor response to static loading.
2. The major work during the reporting period was successful qualitative tests of the strain gage system on the Si wafer.
 3. As of report date, no major problems are seen to impede progress. One of the challenges we have encountered is the ability to consistently solder wires to the microscopic sensors without damaging the substrate. While we have successfully performed it, it involves painstaking precision and time consuming. We are looking at improved and more productive methods to accomplish this objective. We expect to complete the project on schedule.
 4. The total cumulative cost on this project so far is \$39,844.87.
 5. The cost to complete the project is currently estimated at about \$24,000. We expect to keep the total cost to remain within the proposed cost estimate.
 6. Roughly 75% of the work has been completed. The most critical part of the project has been successfully completed. We are now conducting tests to establish the quantitative response characteristics of the sensor. We are currently modifying the design of constant voltage anemometer and fabricating a test rig to conduct these tests. This effort will be completed before the end of September.

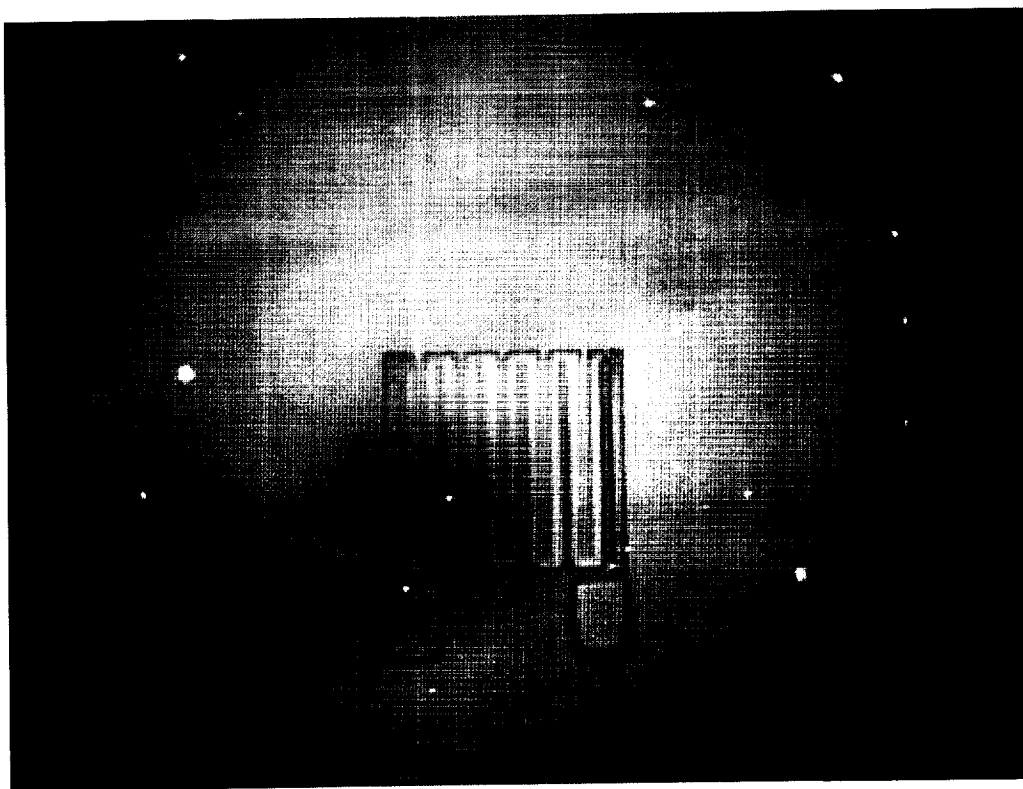


Fig. 1

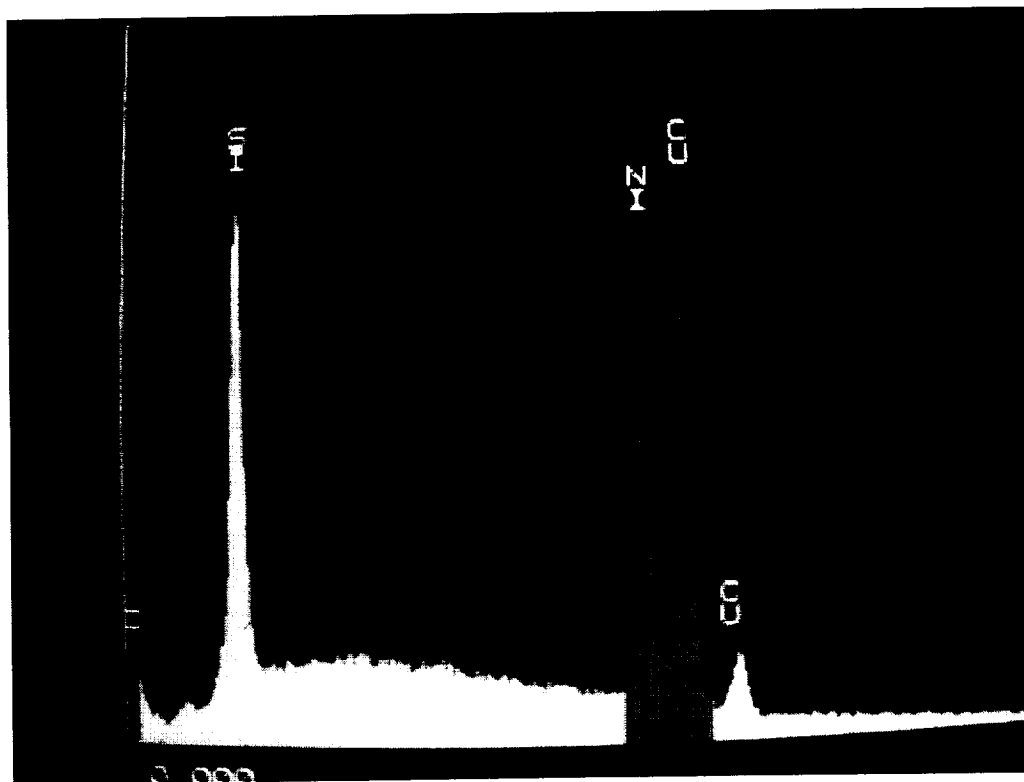


Fig. 2

REPORT DOCUMENTATION PAGE

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